PDES, Inc.
STEP Architecture and Framework Team

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Agenda

- **Current Architecture/AP Interoperability activities**
  - **IRs and concerns with WG12 response to STEP Architecture/Framework Issues**
  - **STEP Methods documents**
  - **Proposal for Part 21 support of multiple APs in a single file**
    - » **Input to WG11 planning project for Part 21**
- **Actions from the January '97 WG10 workshop**
  - **AP Modularization**
  - **STEP Framework**

Concerns with WG12 response to STEP Architecture/Framework Issues

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- SEDS 120: at least one product_category for product
  - Issue was rejected
  - Do not understand how this could have happened
- SEDS 121, 124, 128 : same data in multiple contexts
  - 124 and 128 accepted
  - 121 open
- SEDS 122 : all products have pdf's
  - Issue was rejected
  - Will this preclude AP Interoperability?
- SEDS 165, 79 : Versioning
  - Issue still open
- Upward compatibility

SEDS 120 : at least one product category for every product

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- From WG12 workshop notes : Is was agreed that this issue is unpersuasive, since there are APs for which this constraint is not valid.
  - Yet from "Information Units" WG10 paper by Julian Fowler:
    - » One of the common requirements of many different application domains is to be able to classify or categorize products.
    - » The product category information unit - The constructs within this information allow different applications to use common, generic data model elements for the following requirements:
      - identifying and describing classes/categories of products (product_category)
      - establishing relationships between different classes of product (product_category_relationship ; a typical usage of this construct is to describe subclass/superclass relationships
      - identifying the product(s) (instances of the product entity data type) that are classified as being members of a class (product_related_product_category)
    - » This information unit therefore provides a classification view of products.

SEDS 121: associations between product_definition and product_definition_context

- From WG12 workshop notes : This issue was discussed with respect to an example of product data with the context "design" being used in a "manufacturing engineering" context. Mitch Gilbert suggested that this is satisfied in the current structure by creating a second product_definition (with the context "manufacturing engineering") that is associated with the "design" product_definition . Julian Fowler suggested that an alternative would be to change the context to be "design and manufacturing engineering".
- This issue was left open pending discussion of other related issues. It was suggested that it is resolved by the resolutions to issues #124 and #128. Larry McKee will review this issue and respond via the WG12 exploder.
  - See the next page!

SEDS 124/128 : cardinality of application_context_element to application_context

- From WG12 workshop notes : A proposal to add application_context_relationship and application_context_element_relationship, as well as changing the cardinality of application_context_element.frame_of_reference and application_protocol_definition.application was discussed and agreed. It was also agreed that there is a need to describe how these schema extensions are to be used (in the Interpretation Procedures document).
- Concern : What does this imply for SEDS 121?
  - See previous page!

SEDS 122: inverse relationship for product_definition_formation to product

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- From WG12 notes : Is was agreed that this issue is unpersuasive, since there are APs for which this constraint is not valid.
- PDES, Inc. concern: Which APs are these? Do they have ANY life cycle stage, product category, discipline type, application_context or product definition context in common with the APs we have been studying?
  - If so, how can AP Interoperability concerns be addressed?

SEDS 165/79 : versioning (document or identification_assignment)

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- From WG12 notes: After considerable discussion no consensus was reached; three possible approaches were identified:
  - the proposal as included in issue #165
  - usage of the current document and document_relationship constructs together with version identification
  - mapping of requirements for configuration management of documents to product (making use of the proposed extensions in issue #182)
- PDES, Inc. concern: Issue is still open and a “show stopper” for Part 41 by all those involved in the disagreement
  - How generic is generic enough?
  - How efficient is efficient enough?
  - Disagreement on how and where “AP Interoperability” is incorporated into STEP and who is the customer for the IRs?

Upward Compatibility

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- From WG12 notes : In advance of discussing details of technical issues, the criteria to be used in assessing proposed changes to the IRs. This discussion was initiated by a concern, stated by Larry McKee, that implementors would be unhappy with changes that compromise "upward compatibility". After discussion, it was agreed that four criteria should be used in assessing changes:
  - upward compatibility
  - consistency
  - extensibility
  - satisfying requirements
- Where upward compatibility implies the need to change software when a new edition on an AP is published that incorporates modifications to IR constructs that were used in the previous edition, where there has been no change in the agreed requirements within the AP.

Upward Compatibility...

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- There are also "upward compatibility" issues for implementation across multiple APs. Julian Fowler suggested that such concerns would be valid in the case where AP1 (that uses the 1994 edition of the IRs) and AP2 (that uses a later edition of the IRs) have shared requirements for which there are then different solutions.
- PDES, Inc. concerns: An real implementors view - just 203 & 41
  1) Upward compatibility as defined/expressed is incorrect. The pushing of the enablement of upward compatibility to the parser rather than the data structures is not well thought out.
  2) Toolkit vendors will reject this definition of upward compatibility and not implement changes to their parsers.
  3) Application developers are unduly impacted since changes are not upward compatible.
  4) Changes have very little material impact on AP203 data content. Merely a re-structuring of existing concepts in a new manner. Average impact per PDM application - 2 - 4 man months.

STEP Methods documents

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- Standardizing AP contexts
  - As part of the beginnings of a STEP Framework, standardize all STRING values in APs, particularly those that specify the "context" for the data
  - Initial activity to review AP202 and AP203 (IS status) and harmonize the string values and semantics of the string values across APs has been completed
  - Documented these values in the STEP AIM Development Guidelines
- Standardizing management resource assignment entity naming conventions for use across APs
  - ABSTRACT IR entity is group_assignment
  - Proposed ALL AP entity subtype named applied_group_assignment with any additional semantics specified by an associated role
    - » No semantics associated with subtype name in AP!
  - Proposal is to make this part of the Intepretation Methods document

White Paper on Part 21 Support for Multiple APs

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- Scope of the Paper
  - Scenario: See AP202/203 paper
  - Data from multiple APs existing within one Part 21 file
- A recommended approach
  - Change Part 21 header to allow multiple APs in one file
  - Allow multiple data sections in one file
  - All data in a data section based on one AP
  - Allow references across data sections regardless of which AP the data section is based upon
  - Existing files are still valid Part 21 file supporting upward compatibility
- Areas for future consideration
  - References between multiple files
  - Better support for SDAI AP Interoperability concepts

Ideas for Modularizing APs

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- PDM schema development
  - AP Interoperability changes, 203 items, 232 items and 214 items
  - Currently only an AIM-based schema exists, ARM is implicit in existing APs
  - Potential basis for harmonization with OMG RFP for "PDM enablers"
- AICs plus ARM and mapping tables based on UoFs, conformance classes or something else (like our AP Interoperability focus items)
- Begin with the "STEP conceptual model" as discussed by Phil Kennicott and the IPO ad hoc group
- Base modularization on the "information units" concept as discussed by Julian Fowler's paper on this subject

PDM Schema

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- Issues to address: external definitions, documents, drawing as product, parts list, drawing list consistent across APs
- Schema requirements:
  - Take Part ID, Assembly, Change and Management Resources from the current APs (203 IS, 214, 232, 209, 210)
  - Add the PDES Inc AP Interoperability changes in these areas
  - Add the document, document_version new stuff to be in Part 41 based on the AP 232 requirements as modified by the AP Interoperability requirements from AP214
- The intent for the resulting schema is to be a subset, conformance class or shared AIC between future releases of AP203, AP232, AP212 and AP214
  - We can probably add AP209 and AP210 to this list
- This schema is to be validated in PDES Inc PDMNet, STIR and the ProSTEP PDMI projects and perhaps the joint ISAP pilot.

AP Interoperability Focus Items or Potential AP Modules

- **Product Identification**
- **Assemblies**
- **Change**
- **Effectivity**
- **Management Resources**
- **Document versioning, external references, requirements**
- **Shape Tolerances**
- **Surface conditions, materials, uncertainty**
- **Presentation/Draughting**
- **Shape Features**
- **Process Plans**

STEP Framework

- **Papers collected after WG10 workshop**
  - **Framework for STEP**
    - » **Danner 1990 NISTIR**
    - » **Kirkley/Seitz 1991 paper**
    - » **Palmer 1991 minutes**
    - » **Kramer/Palmer/Feeney 1992 NISTIR**
    - » **Digital 1995 paper**
  - **Implementation Architectures**
    - » **Danner/Law 1992 paper**
    - » **Wenzel 1992 paper**

STEP Framework...

- **Papers collected after WG10 workshop**
  - **Upward Compatibility**
    - » **Eirich 1991 paper**
    - » **Bloom 1991 paper**
    - » **Shaw 1991 paper**
  - **Core/Kernel for STEP**
    - » **Anderson 1990 and 1991 papers**
    - » **Schenck 1990 paper**
  - **AP Interoperability**
    - » **Bloom/Silvestri 1991 paper**
    - » **Burkett/Anderson/Gilbert paper**

STEP Framework...

- **Initial Impressions**
  - **Problem has been identified for 5-7 years yet little to no action in SC4 until very recently**
    - » **WHY?**
  - **About 1/3 of these papers could form the basis for an "evolution" of current architecture into something which addresses many of the PDES, Inc. architecture, framework and AP Interoperability concerns**
- **PDES, Inc. will commit further resources to publishing a STEP AP Framework in the short term**
  - **Perhaps as an SC4 standing document? As an "industry" document for the electromechanical domain? A recommended practice or SC4 TR?**
  - **Would timeframe for initial draft to align with the San Diego ISO meeting**